(NASA-CR-150191) PHASE 2 DESIGN STUDY OF THE ELECTRONIC ASSEMBLY FOR THE HRUV SPECTROMETER/POLARIMETER INTENDED FOR THE SOLAR MAXIMUM MISSION. IMPLEMENTATION PHASE PROGRAM (SCI Systems, Inc., Huntsville,

N77-18205
HC A03
MF A01
Unclas
G3/19 17232

PHASE II DESIGN STUDY
OF THE
ELECTRONIC ASSEMBLY
FOR THE
HRUV SPECTROMETER/POLARIMETER
INTENDED FOR THE
SOLAR MAXIMUM MISSION

IMPLEMENTATION PHASE PROGRAM PLAN
REVISION A

NASA/MSFC CONTRACT NAS8-32035

JANUARY 18, 1977

SCI SYSTEMS, INC.
8600 SOUTH MEMORIAL PARKWAY
HUNTSVILLE, ALABAMA 35802

SCI SYSTEMS, INC.

1.0 INTRODUCTION

This IMPLEMENTATION PHASE PROGRAM PLAN defines SCI's approach to the implementation of the next phase in the development of the Electronics Assembly (ERA) for the High Resolution Ultraviolet Spectrometer/Polarimeter Instrument (HRUV-SPI) to be included as an Experiment on the Solar Maximum Mission (SMM).

The Implementation Phase is the third phase (P-III) in the development cycle. The primary function of P-III will be to convert the ERA design of P-II (Design Study Phase) into deliverable flight hardware.

The original P-III Program Plan was generated and submitted in mid July 1976. This was the early stages of the P-II Design Study. Thus, the original P-III Program Plan was generated without the benefit of the results derived from the Design Study; which are extremely important to the job tasks of the Implementation Phase. Since that time the results of interface meetings and the design study itself have altered the hardware, and clarified and refined its requirements. As a result a better definition of the Implementation (execution) Phase is now possible.

At SCI a reorganization of the Instrumentation Department, in which this program resides, has occurred since the original plan was written. Although not an impact to the program, and in fact an organization change which is structurally more in line with the program's goals, it is important to acknowledge the change.

This Revision A to the Implementation Phase Program Plan is generated to better define the present program requirements and SCI's approach to the execution of the various tasks necessary to implement the program.

The schedule provided is based on the current information included in this revision A, and this plan is the descriptive proposal upon which SCI has priced the Implementation Phase.

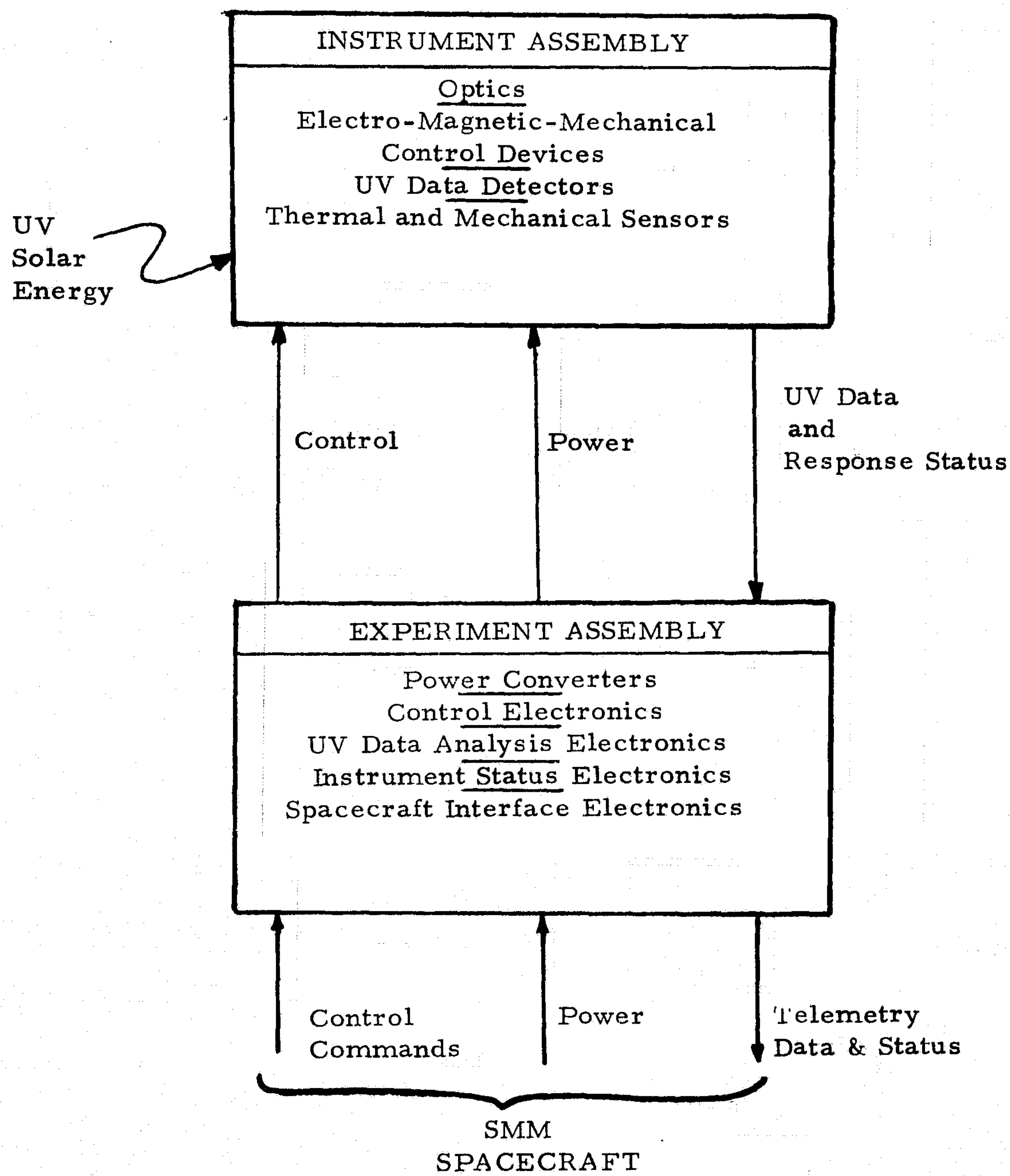
2.0 PROGRAM DESCRIPTION

The HRUV Spectrometer/Polarimeter Experiment consist of an Instrument Assembly (IRA) and an Electronics Assembly (ERA). The HRUV-SPE First Level Block Diagram illustrates these two major assemblies and their simplified interfaces.

The IRA receives the UV Solar Energy and contains the Optics that control and route the UV energy to the UV Data Detectors. It also contains the Electro-Magnetic-Mechanical Control Devices that allow flexibility in the functional operation of optics to selectively scan the UV spectrum, UV point of source (focal and raster) and relative energy magnitude in selected "light" paths. Also included are the sensors of mechanical positioning devices for control feedback to the electronics and thermal sensors that also provide status as to temperature affects on the optics control of the UV. Responsibility of the IRA and its devices belongs to GSFC and MSFC. This aspect of the program is not a part of SCI's effort and this Program Plan except at the interface to the ERA, which has been defined during the Design Study Phase. SCI will supply a second Power Converter that will be employed in the IRA.

The ERA contains the Power Converter, Control Electronics, UV Data Analysis Electronics, Status and Monitoring Electronics and the Spacecraft Interface Electronics. The ERA has two basic interfaces: one with the IRA that allows transfer of Electronic Control and Power, and the reception of raw UV Data and the Response Status; the second interface is with the SMM Spacecraft for a power source, control up-date and modification, and to supply the Experiment Data and Operational Status via the telemetry.

The ERA contains the following specific components to perform the functional requirements and operate the interfaces as previously defined.



HRUV SPECTROMETER/POLARIMETER EXPERIMENT

First Level Block Diagram

COMPUTER (CPU)
STATUS MONITOR (SM)
DUAL POWER CONVERTER (DPC)
EXPERIMENT LOGIC UNIT (ELU)
JUNCTION BOX (JB) AND CABLES

Rather than design a totally new system the HRUV-SPE will utilize Engineering Model Hardware from a similar, but previously developed HRUV Spectrometer, used in the OSO-I mission. The above components from that Experiment will be modified where necessary to provide the SMM required functional capability and its Spacecraft Interface characteristics. This basic concept and its adaptibility to SMM was studies for feasibility in Phase I, and was studied for specific modification requirements in Phase II.

The previous studies have shown that the CPU and SM will not require modification or alteration in any way by SCI to meet the functional and mechanical design goals. P-III will thus be concerned with the development aspects of the ELU, DPC, JB and Cables. The design requirements were specified in P-II. The following general tasks must be performed during P-III.

1. Convert the P-II Design into a breadboard system by modifying the OSO breadboards and fabricating additional breadboard hardware to fulfill the unique SMM requirements.

2. Evaluate the breadboard system operation using the Spacecraft Simulator developed during P-II. This will require the completion of the following tasks begun during P-II.

   a. Simulator Software/Hardware Debug
   b. Simulator ICD/ERA Interface Verification
   c. ERA Software/Hardware Debug using the Simulator

NOTE: These tasks will require that time be included to make hardware & software corrections as problems are uncovered.

3. Parts Procurement

4. Translate the final breadboard hardware design into the packaging necessary for flight hardware. This will consist of PC Board Partitioning, schematic and wire list generation as related to the partitioning, PC Board design layout, mechanical design, and assembly design.

5. Hardware Fabrication

6. Engineering Testing and Evaluation

7. Qualification/Acceptance Testing

This plan along with the Quality and Reliability Plan generated during PII will control the development of the Implementation Phase hardware.

3.0 PROGRAM REQUIREMENTS

3.1 EXPERIMENT LOGIC UNIT (ELU)

The flight ELU will be fabricated, tested and supplied as a unit for application in the ERA. The unit will consist of: 10 PC boards removed from the Engineering Model (EM) OSO ELU and modified for SMM application, 8 PC boards of new design and fabrication, a wired internal and external connector interface, and housing of new design and fabrication. This unit will functionally operate as defined in the ERA PDR, with the changes as stated in the results to that meeting. The only exception is the SLIT logic, the interace is to be defined by GSFC/GE and agreed upon by MSFC/SCI.

During this phase SCI will complete the modification of the OSO breadboard. This will consist of modifying existing boards and fabricating new boards for the functions new to SMM and the S/C interfaces. The breadboard main frame wire interconnect will be altered per the required board and interface changes. The OSO breadboard cables will be modified per section 3.4 and used to test the unit using the manual mode of the ICD. Additional subsystem testing will be performed using the ICD manual mode and the ICD automatic mode in conjunction with the PDP-11 and software supplied as GFE by Lockheed. SCI does not propose any software tasks or effort, but will work with Lockheed personnel to debug the hardware/software and perform subsystem level evaluation.

SCI will be responsible for unit level testing and the procedures required for that purpose. Subsystem level testing using the PDP-11 will be the responsibility of the software personnel. Any procedures or documentation at that level will be a software responsibility. SCI will assist in these test to perform subsystem functional analysis and to diagnose hardware problems. SCI

will be responsible for making all hardware modifications, changes or corrections. Upon successful completion of the test the CDR will be held and followed with the translation of the breadboard hardware to the flight configuration.

Modifications to the 10 PC boards from the OSO ELU will be performed as defined at the PDR and as outlined in Attachment A generated during PII. SCI process and material specifications submitted during PII will be employed.

The 8 new PC boards will be partitioned from the PII design, and design/layout perfomred. Boards will be of a density capable of double-sided, plated-thru-hole technology. SCI process specifications will be employed for this task. A parts list for the ELU is enclosed and the parts program is described in Section 3.6.

SCI will design and fabricate the ELU housing per the enclosed Control Drawing. The materials to be used are Magnesium Alloy Type AZ31B, per QQ-M-31; Magnesium Alloy Type AZ31B-H24, per QQ-M-44; Aluminum Alloy 2024-T4, Hex Stock, per QQ-A-225/6, Aluminum Alloy 5061-T6, per QQ-A-225/8, and Stainless Steel QQ-S-776, Condition A, Type 303, all of which were used for various mechanical piece parts in the OSO-ELU. Other mechanical parts are identified in the parts list.

Signal interface of the ELU will be accomplished using direct wiring of the PC board connectors and the external interface connectors. Connector and wire are included in the parts list. SCI Process Specifications submitted during PII will be employed.

SCI will generate an Acceptance/Qualification Test Procedure that will detail the electrical functional test and environmental testing required. The SCS-ICD will be employed to conduct these test and will verify the functional requirements

of the ELU. Characteristics of the interface circuits will be verified by proper functional operation, based upon the similarity of the ICD interface to the spacecraft and other Experiment units. The procedure will identify Applicable Documents, Test Equipment, Test Conditions, Test Records, Visual Inspection, Weight, Center of Gravity, Functional Testing and Environmental Testing based upon sections 9.3.2 (Thermal-Vacuum Functional Testing), 9.4 (Vibration), 9.5 (Shock per table 9-3) and 9.7 (Acceleration) per SMM-670-01. Only Thermal-Vacuum Testing will be conducted with the unit powered and functional. A functional test will be performed prior to the first environmental test and followong each environmental test. Software and procedures supplied as GFE will be employed to use the SCS-ICD to conduct the functional test.

The OSO ELU was controlled by SCI "X" level documentation and that procedure will be retained for SMM in the interest of cost and schedule.

3.2 DUAL POWER CONVERTER (DPC)

Two flight DPC's will be fabricated and tested. One of these units will be supplied for application in the ERA and the other for the IRA. These units will be of identical design and construction.

The DPC designated for IRA application must be supplied early in the program as identified in the schedule. This unit will be a modification of the OSO-DPC. The housing and connector assembly will be used from the OSO-DPC. The Relay Switching and Voltage Transient PC Board will be the OSO-DPC board modified per the PDR. The two Convertor PC Boards will be identical, but of a new design and fabrication. To achieve the schedule; this unit will only be thermal tested for 8 hours at each of the three temperatures identified in Figure 9.2 of SMM-670-01. One functional test at each temperature and one cold start will be conducted. The remaining Environmental

tests are requested to be waivered since there will be no mechanical changes and the second unit testing will confirm these functions.

The second DPC will be fabricated from the same documentation used to build the OSO-DPC and to modify that DPC to the SMM configuration.

A parts list for the DPC is enclosed and the parts program is described in section 3.6.

The OSO-DPC test set will be modified per the requirements of the new Converter PC board and used for functional test of the SMM-DPC. The existing Acceptance Test Procedure will be modified per the requirements of the new converter design and the SMM Environmental testing as previously described in section 3.1

The second DPC will be tested per the same environmental test described in section 3.1. The DPC test set will be employed for a functional/electrical testing.

3.3 ERA-JUNCTION BOX (JB)

The ERA-JB is employed in the system to interconnect unique signals that are common to more than one Cable Harness and to branch power, grounds, and signals to multiple destinations from a limited source of distribution. The ERA-JB consist of a housing with 6 external connectors, a PC board to bus the multiple power, ground and signals, EMI filters for the S/C power and a connector to connector, or connector to bus terminal interconnect. The ERA-JB functions as an electrical interconnect and is a non-functional electronic device.

SCI will design and fabricate the PC board per the cable diagram and wire list developed in PII. The housing will be designed and fabricated per the enclosed control drawing. The PII wire lists will be used at the assembly level to interconnect the connectors, filters and PC board busses.

A parts list for the ERA-JB is enclosed and the parts procurement described in section 3.6.

Continuity and isolation tests will be performed on the JB using standard lab test equipment. Only the vibration environmental test will be conducted (SMM-670-01 section 9.4).

3.4 ERA CABLES

One cable set, consisting of one each of the following cables, will be constructed for the ERA:

Spacecraft Power Cable - SPC
Spacecraft Interface (Signal) Cable - SIC
Computer Cable - CC
Bi-Level Data Cable - BDC
Analog Data Cable - ADC
Control and Power Cable - CPC

These cables will be constructed per the Cable Diagram and Wire Lists developed during PII. The physical characteristics of the cables will be constructed per specifications supplied by MSFC/GSFC.

The enclosed parts list for the cable set identifies those parts required to fulfill the functional interconnect and parts that SCI assumes will be required to fulfill the physical requirements.

The cables will be continuity tested and selectively isolation tested using standard lab test equipment. A functional test will be performed by using the cables in conjunction with the ELU and SCS-ICD. No additional testing is proposed.

3.5 INTERFACE CONNECTORS

SCI will supply the following connector types and quantities for interface with the ERA/SPACECRAFT, IRA/IE CABLES and for the IE (Intra-Experiment) CABLES. These connectors will be screened by SCI using procedures previously employed in the OSO program. The connectors will be purchased to SCI specifications A016032 and A016033 as previously approved for the OSO program. The two specifications must be modified to include the 22 pin version of the JT connector.

SPACECRAFT INTERFACE

POWER - JTG06RE-12-35S(011) - SCI PN 016033-07 - 1 Ea.
SIGNAL - JTG06RE-22-35S(011) - SCI PN 016033-01 - 1 Ea.

IRA CONNECTOR - INTERFACE TO IE CABLES

IRA-CPC-J1 - JTP02RE-24-35P(011) - SCI PN 016032-02 - 1 Ea.
IRA-ADC-J2 - JTP02RE-22-35P(011) - SCI PN 016032-01 - 1 Ea.

INTRA INSTRUMENT CABLES

IE-CPC-P1 & P2 - JTG06RE-24-35S(011) - SCI PN 016033-02 - 2 Ea.
IE-ADC-P1 & P2 - JTG06RE-22-35S(011) - SCI PN 016033-01 - 2 Ea.

3.6 PARTS PROGRAM

Parts for the SMM-ERA units are dictated to a large extent by the reuse of OSO units and portions of OSO units that are to be modified. To some extent they are also influenced by existing breadboard units, test equipment and test

fixtures so that interfaces will be compatible and a minimum of new such devices will be required, thus reducing program cost.

The original OSO hardware was designed using PPL-12. Where a part was not available on PPL-12, a NSPAR was submitted for approval to use the part. Where applicable, parts were procured to existing government specifications, if approved for use on the OSO program. In the remaining cases SCI generated a procurement specification and obtained OSO program approval. In a limited number of cases a waiver was granted to use parts that had a unique requirement.

Since OSO parts were either procured as PPL-12 parts to approved government specifications or procured after gaining approval via a NSPAR and SCI specification, those parts are valid candidates for use on SMM. To reduce cost, minimize part types in the system and gain the advantage of previous experience, the SMM modifications and new designs have been based on OSO parts. For the additional required parts, PPL-12 and MIL-STD-975 were used as the selection guide. For those parts that are not available from any of these sources, SCI will submit a NSPAR and procurement specification.

Where it is not possible to purchase parts to approved specifications that dictate the screening as specified by PPL-12 or where SMM-300-01 specifies additional screening, SCI will purchase the parts to the best available screening level. That part will then be further screened as deemed necessary to SCI screening specification 2910101.

SCI will perform Incoming/Receiving Inspection for verification of visual, mechanical and electrical characteristics on all parts and materials. This will verify conformance to the requirements of the controlling documentation.

All JANTX and JANTXV transistors will be screened by SCI.

GSFC document SMM-300-01, section 4.6.9 (Construction Analysis) states that construction analysis may be performed on monolithic capacitors and internal inspection may be performedon a de-capped sample of each lot or date code lot of microcircuits and transistors. Considering the history of the OSO parts, the indecisive requirement and the requirement to minimize program cost; SCI does not propose to include Construction Analysis as a part of the parts program except as noted in followcng paragraphs. SCI does not plan to utilize custom microcircuits.

Per the last sentence of SMM-300-01, section 4.6.11 (Failure Analysis) SCI has only included a minimum of cost for this effort.

This report is accompanied by parts lists for the ELU, DPC, JB and Cables. Since the mechanical design has not been performed, specific parts and materials have not been identified. A general listing of parts and materials used on OSO is included. This list will be employed as a selection guide for the SMM mechanical assemblies.

The following paragraphs describe the notes found on the previously identified Parts List:

Note 1 - Part was not used on OSO and will require that a NSPAR be written and submitted.

Note 2 - Part cannot be procured to an acceptable specification and will require that a specification be generated by SCI, reviewed by the vendor and approved by NASA.

Note 3 - Part not available to MIL-M-38510 but was approved for OSO. Due to the low quantity (3) of usage and a quantity of 13 still in stock from that program; SCI proposes to transfer them for use on SMM. SCI will submit 2 devices to GSFC for

Construction Analysis, but does not proposed to re-screen these devices (they were screened for use on OSO). SCI will perform a 100% electrical test on these devices.

Note 4 - This part is from the same parts family (54L) as other IC's approved for OSO, listed on PPL-12 and available as MIL-M-38510. Due to this similarity, SCI has based its design on this part and will submit a NSPAR. The part will be procured to 883B and screened to 2910101. Parts will be supplied to GSFC for CA.

Note 5 - This part has no suitable PPL-12 replacement and is necessary due to the functional requirements and packaging restrictions of the DPC. Cost is thus warranted to submit a NSPAR. The part will be procured to 883B and screened to 2910101. Parts will be supplied to GSFC for CA.

Note 6 - This previously approved specification will be modified to include this size. There is no functional or electrical change to the specification.

Note 7 - The previously approved specification will be modified to include the male mate.

Note 8 - This material replaces the following that was used and approved for OSO: 020133, 020134, 020135 and 020136. This is an improved conformal coating material over the Vorite. This material specification was submitted during PII.

Note 9 - All connectors will be screened by SCI.

Note 10 - All Transistors will be screned by SCI.

Note 11 - The DM7820A and DM7830 have been specified (SMM-670-01) as spacecraft interface devices. Due to the low usage (4 ea & 1 ea) in the SCI design, SCI request that these parts be supplied by the SMM Program Office. NSPAR, Specifications and Testing have not been included in SCI's SMM program plan.

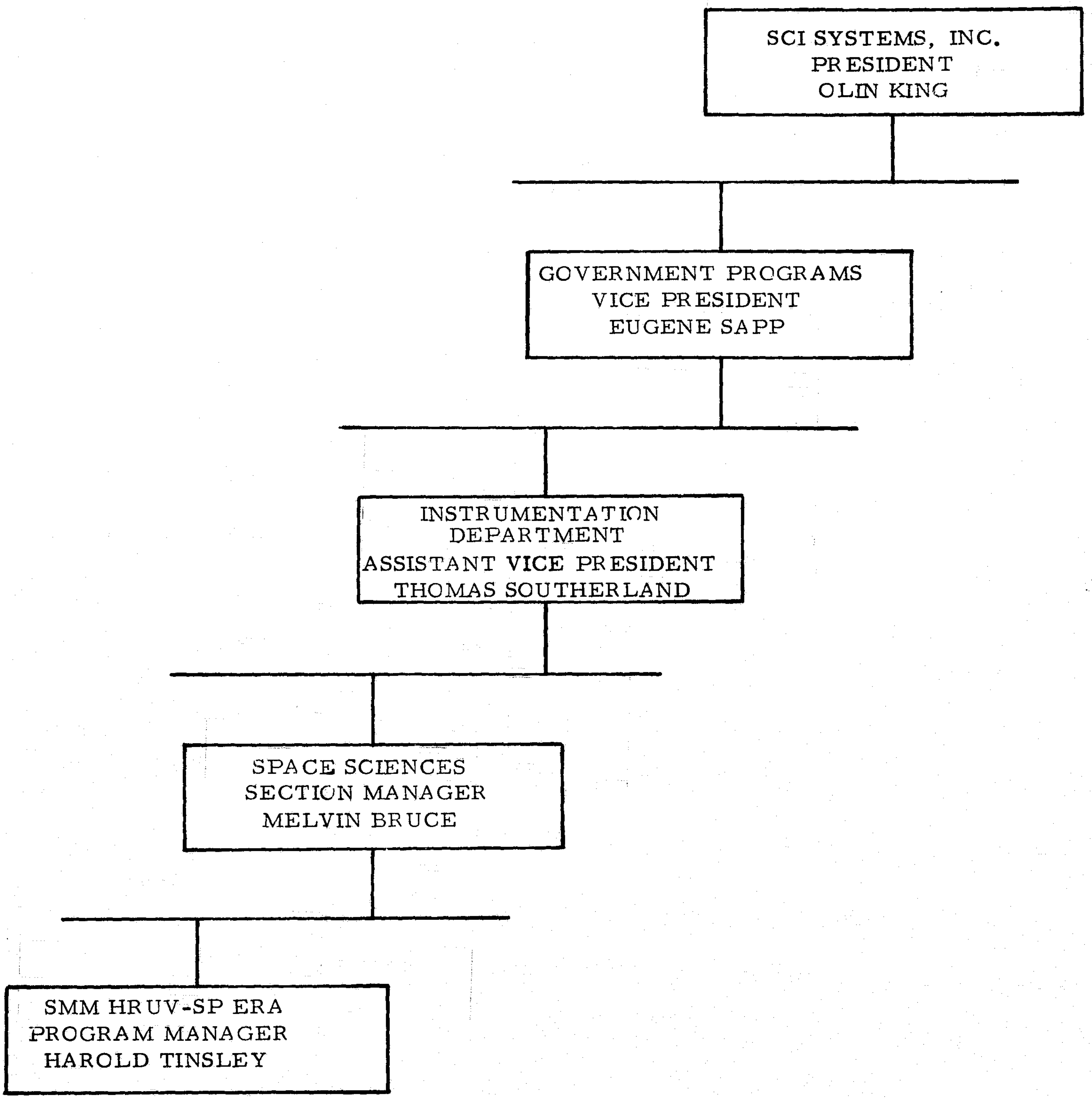
Also enclosed is a list of parts SCI request authorization to transfer from the OSO program stock to be used on SMM. These parts are either mechanical in nature or of small usage and involve unique purchasing problems making it highly desirable that they be transferred.

4.0 PROGRAM ORGANIZATION

The Program Organization will be a continuation of that employed during the Phase II Design Study. The nature of the program tasks will vary and the involvement of Support Groups in the program will increase. While support from contracts, publications and accounting will remain much the same, support from such groups as manufacturing, procurement, screening, shipping/receiving, configuration control, design/drafting, etc. will be much more involved.

The program will continue to be managed from a Program Office which resides within the Space Sciences Section of the Instrumentation Department. The Assistant Vice President of the Instrumentation Department reports directly to the Corporate Division Vice President of Government Programs. This organization and direct contact structure with SCI Executive Management assures that any potential problems which may cause program impact are quickly brought to the attention of Corporate Management for resolution and action. The structure of this reporting path is illustrated in the attached Organization Chart.

The Program Office will be directed by a Program Manager/Project Engineer who has overall authority and responsibility for the SMM HRUV-SP-ERA program. He has a staff who will direct and coordinate with the support groups the various tasks necessary to fulfill the program requirements. This staff will include a department Program Administrator to support and assist the Program Manager. He will in turn be supported by an engineering planner. Appropriate engineering personnel will be assigned responsibility for the various engineering tasks for the ELU, DPC, JB/Cables and Spacecraft Simulator. This organization is illustrated in the attached Program Management Chart.



ORGANIZATION CHART

5.0-A OPERATING CONCEPT

The Program Manager has overall authority and responsibility for program performance. All major tasks including design engineering, program control activities, and applicable support organizations report administratively to the Program Manager. The Program Manager is the primary point for direct management and technical interchange between MSFC and SCI. This does not prohibit direct interface at other levels but provides a central focal point for all program related matters. A formal interface will be maintained between SCI and MSFC through the Contracts Administration Department.

In operating as the technical and administrative agent between SCI and MSFC, the Program Manager will maintain responsibility for the interpretation, initiation and accountability of all program related tasks or efforts. He will also provide the technical direction, coordination and administration of this program within SCI.

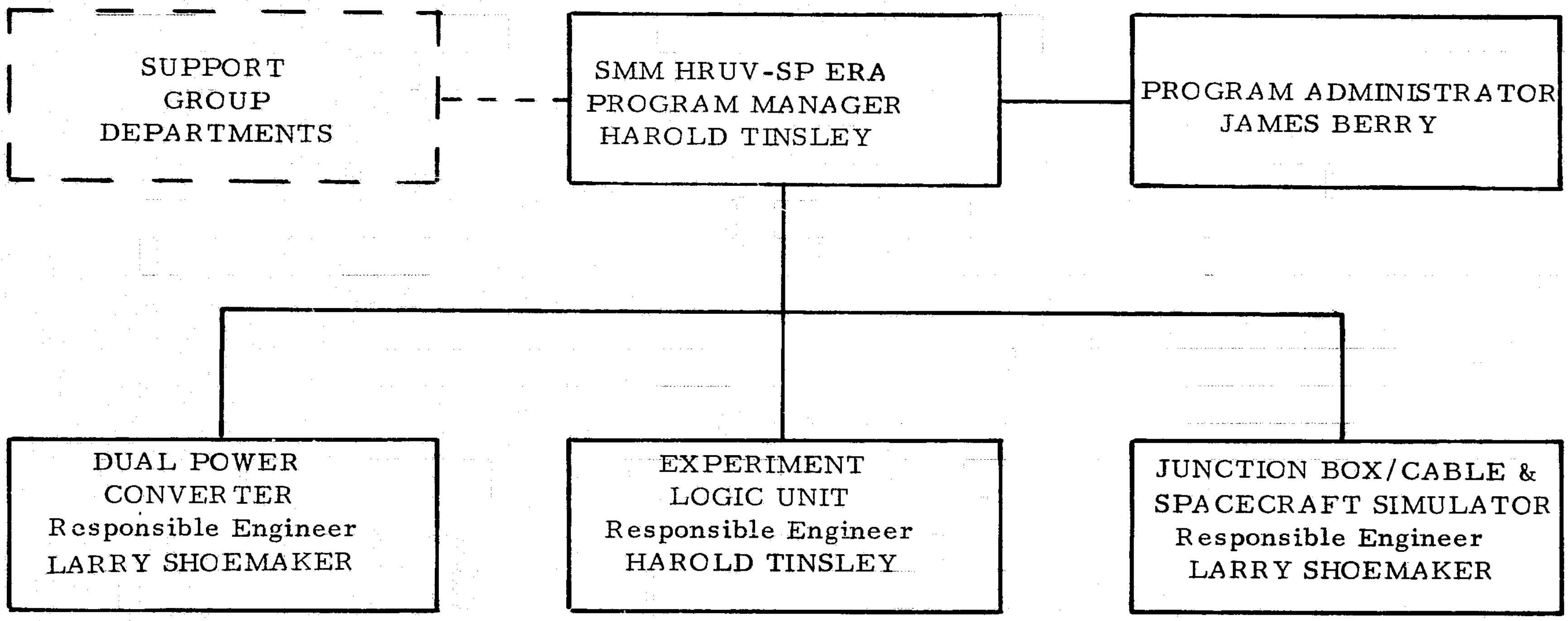
Program status review meetings will be scheduled on a weekly basis to assess the design position relative to planned activities. Participation in these weekly review meetings will be limited to those personnel who have direct cognizance and authority to disposition problems scheduled to be discussed. The Program Manager will chair these meetings and be responsible for the timely notification of personnel to be involved.

Program reviews will be held with SCI management in order to insure timely top management involvement with the program. Overall program status (schedule and cost), problems, recovery plans, facility impacts, key personnel consideration, and anticipated problem areas will, as a minimum, be covered in these meetings.

The Program Manager will coordinate with managers of the Support Groups in advance of their anticipated involvement. They will be informed of the specific program task and/or support required and advised of the anticipated level of effort. Upon their review, scheduling of their personnel will be coordinated such as to meet the key milestones for the program. The concept and its implementation allows the Program Manager to effectively draw upon specific support services and technical and administrative disciplines as required to insure the successful and timely completion of the program. This allows the use of talent and resources far in excess of that which would usually be available for a job of this size and nature.

The Program Administrator provides an Assistant Program Manager capability for the Program. As such, he has associate responsibility and authority for executing the proper program administration and coordination functions. He is responsible for maintaining all program schedules and cost controls resident within the program in addition to providing the primary working level interface between the Program Office and the various SCI support organizations. This is of primary importance in a job of this nature where the development activity is conducted in the engineering laboratory. He will plan, schedule, coordinate and follow the procurement of all parts in conjunction with the manufacturing planning and the procurement support group. Likewise he will perform a similar function for the unique fabrication support needed by the various manufacturing groups. This would include both electrical and mechanical fabrication.

This job consist of three distinctively independent design disciplines of power conversion, logic control and processor controlled automated test set (Spacecraft Simulator). A responsible design engineer has been assigned to direct the development in each of these areas. Their responsibility will be to specify, design, initiate documentation, direct construction and testing of the hardware.



PROGRAM MANAGEMENT CHART

It is anticipated that a number of support groups will be involved in the implementation of the program requirements. Of specific concern will be evaluation of the design by reliability and quality engineers to insure that the flight hardware to be fabricated during the Implementation phase will result in reliable space quality units. Execution of the Reliability and Quality Tasks during this program are defined in detail in their associated plans submitted during the Phase II Design Study. Also supporting the Program Office will be contracts, procurement, accounting, configuration control, design/drafting, publications, and various manufacturing facilities.

To support this design and development type program, laboratory space and equipment will continued to be provided by the Space Sciences Section Manager. The responsible program engineers will have full utilization on a non-interferring basis. Engineering level technicians from this section have been assigned to assemble and support testing of the hardware.

5.0-B SCHEDULING

Included in this Program Plan is the revised Program Schedule. The schedule lists the various program tasks, illustrates the time involvement and the time relationships of the tasks.

The ERA Breadboard modification, and the fabrication of the additional functions, was begun during Phase II and will be completed during P-III. Occurring in parallel with this effort and must also be completed prior to beginning the testing and evaluation of the Breadboard ERA, is the interface of the Spacecraft Simulator hardware (ADP/ICD) and its operational software. Upon completion, testing and evaluation of the Breadboard ERA hardware and associated control software, is the next major effort. As various segments of the hardware are tested and verified the parts will be placed on order and translation of the breadboard design into the flight design layout will begin. Both of these efforts should be well into the advanced stages when the final breadboard testing is completed. Procurement of the PC boards and fabrication of the mechanical piece parts follows the design layout of PC boards and design of the mechanical parts and housings. With the delivery of electronic piece parts and PC boards the electronic fabrication can begin and will end with the assembly of the units. Engineering testing of the units and the ERA subsystem, using the test hardware and software developed for the initial breadboard test and evaluation is conducted to verify the flight hardware functional design. This will be followed by unit Acceptance/Qualification Testing.

6.0 DOCUMENTATION

Engineering level documentation to control the breadboard modification and fabrication was generated during P-II and technically reviewed at the design review and interface meetings held during P-II. Engineering test procedures will be developed during P-III. These procedures and documentation will be utilized during P-III for the Test and Evaluation of the ERA units.

An on-going need to identify parts selection for the flight hardware was begun during P-II and will carry over into P-III. As parts, materials and processes are identified they will be submitted for customer review and acceptance. Parts, materials and processes that conform to the various preferred parts list, outgassing and compatibility specifications, and process specifications will be so identified to MSFC. Non-conforming parts, materials and processes will also be identified. In these cases the required Nonstandard Parts Approval Request forms will be generated and submitted for approval. Where necessary procurement specifications will be generated and submitted along with the NSPAR forms. Most SCI process and control specifications that will be required have already been submitted and approved during the OSO program. Their application will be re-identified and all interim revisions submitted as necessary. Should additional specifications be necessary, they will be generated and submitted as early in the program as possible. Certain interface components and parts are identified in the SMM/Experiment General Interface Specification (SMM-670-01), SCI will request that the specifications to be used by the NASA/GSFC SMM Spacecraft Program be provided for SCI utilization.

During the P-III task where the engineering breadboard design is translated into the flight hardware design layout, the formal documentation to SCI "X" Level Control will be generated. These will consist of schematics, assembly

drawings, parts fabrication drawings, PC BD fabrication drawings (drill plan), control drawings, wire list, etc. Also being generated during P-III will be the formal Acceptance/Qualification Test Procedures. Prior to the fabrication task for the flight hardware, the necessary shop travelers, inspection travelers, assembly work orders, etc; needed by manufacturing, will be generated. These will be reviewed and approved by the various support groups such as Quality, Planning, Engineering, etc. This will insure proper manufacturing to the required specifications in a minimum turn-around and that traceability of the product will be maintained throughout the program. An informal FMECA and PSA will be performed early in P-III and reviewed, where changes may have derived from the Breadboard Testing, later in the program. Documentation related to OSO hardware, that will be modified and reused, will be included on the existing "X" level drawings and assigned a -2 configuration.

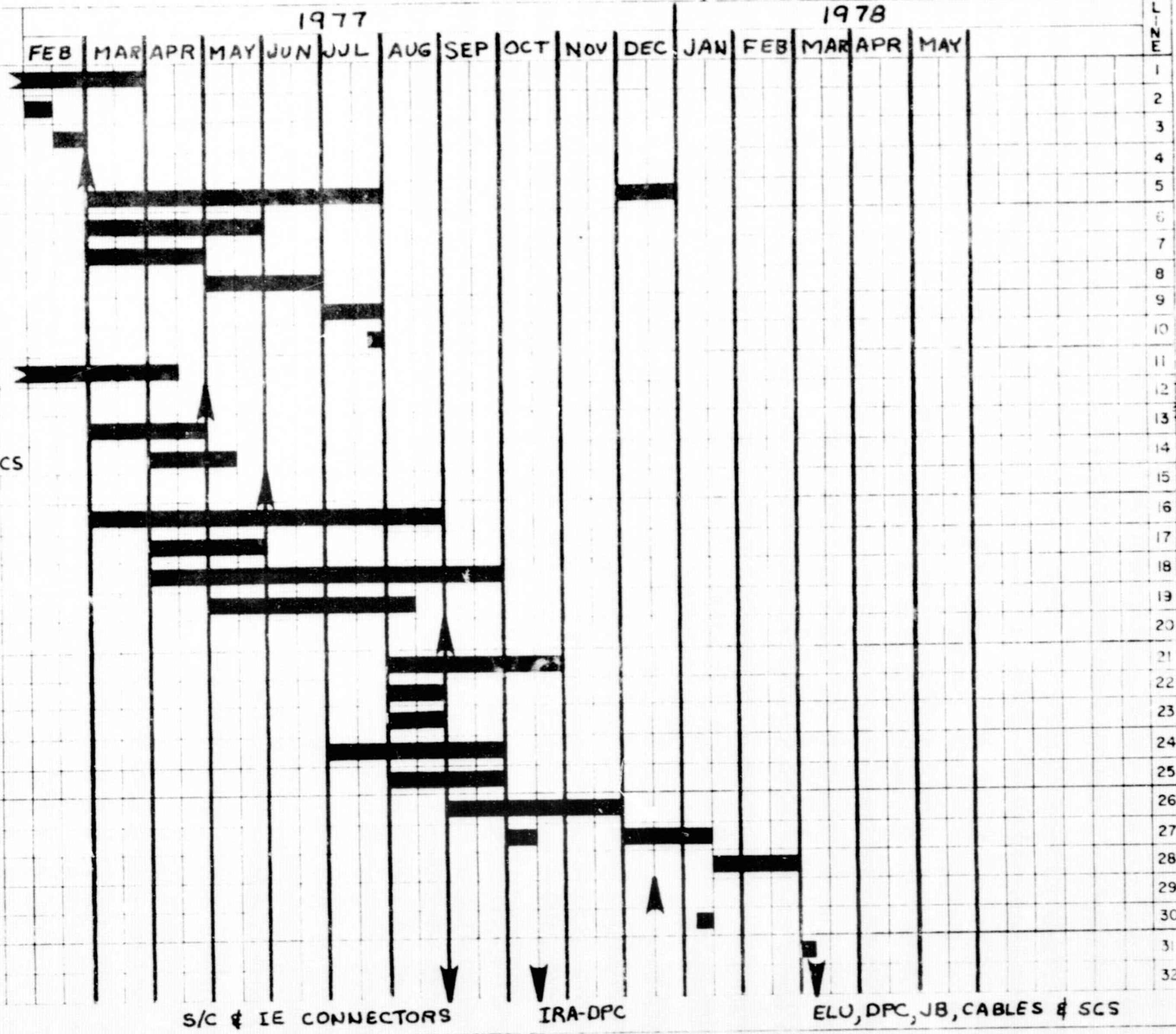
FUNCTIONAL MASTER PLAN

TITLE SMM IMPLEMENTATION PHASE PROGRAM SCHEDULE
CUSTOMER NASA/MSFC
CONTR NR NAS8-32035

PROJ SMM PAGE 1 OF 1
ISSUED 7/14/76
REVISED 1/17/77
PREPARED H. TINSLEY
APPROVED Dr. M. BRUCE

TASKS / MILESTONES

1 ERA-BB MOD & FAB
2 ADP DELIVERY & SETUP
3 ICD/ADP INTERFACE
4 SOFTWARE DELIVERY
5 SOFTWARE SUPPORT
6 SOFTWARE/HARDWARE DEBUG
7 SCS/ERA-BB INTERFACE
8 ERA-BB PERFORMANCE TEST
9 ERA-BB EVALUATION
10 CDR
11 ELEC PARTS LIST, NSPAR & SPECS
12 FINAL APPROVAL - ELEC PARTS
13 PRELIMINARY MECH DESIGN
14 MECH PARTS & MATERIAL - LISTS & SPECS
15 FINAL APPROVAL - PARTS & MAT.
16 PARTS & MAT. PROCUREMENT
17 CONDUCT FMECA & PSA
18 DRAFTING
19 DESIGN LAYOUT
20 SUBMIT ICD DOCUMENTATION
21 DOCUMENT TEST PROCEDURES
22 REVIEW FMECA & PSA
23 REVIEW MECH DESIGN
24 PC BOARD PROCUREMENT
25 MFG. ENG. & PLANNING DOC.
26 HARDWARE FABRICATION
27 ENGINEERING TEST
28 ATP/QTP
29 SUBMIT ERA DOC.
30 FDR
31 PREP TO SHIP
32 HARDWARE DELIVERIES



ELU

QTY REQ'D	ITEM NO.	NOMENCLATURE OR DESCRIPTION	APPROVED FOR	PART OR IDENT NO.	SPEC	MATERIAL OR NOTE
34	1	IC 54L00W	OSO	J38510/02004B	MIL-M-38510	
31	2	IC 54L01W	OSO	/02006B		
24	3	IC 54L02W	OSO	/02701B		
27	4	IC 54L04W	OSO	/02005B		
29	5	IC 54L10W	OSO	/02003B		
29	6	IC 54L20W	OSO	/02002B		
3	7	IC 54L30W	OSO	/02001B		
6	8	IC 54L54W	OSO	/04102B		
12	9	IC 54L73W	OSO	/02103B		
11	10	IC 54L74W	OSO	/02105B		
6	11	IC 54L78W	OSO	/02104B		
3	12	IC 54L75W	—	/TBD		NOTE 1
6	13	IC 54L95W	OSO	/02801B		
31	14	IC 54L193W	—	J38510/02503B	MIL-M-38510	NOTE 1
3	15	IC 54L51W	OSO	015040/50	SCI A015040/50	NOTE 3
1	16	IC 54L123W	—	DM54L123AW/883	883 B	NOTE 4

LIST OF MATERIALS OR PARTS LIST

EXPERIMENT LOGIC UNIT (Qty's for Modifications & New Design)	SIZE A	CODE IDENT NO. 17981	DWG NO PER TITLE
	SCALE	REV	SHEET 1 of 4

QTY REQ'D	ITEM NO.	NOMENCLATURE OR DESCRIPTION	APPROVED FOR	PART OR IDENT NO.	SPEC	MATERIAL OR NOTE
4	17	IC DM7820A	SMM S/C	GSFC	GSFC	NOTE 11
1	18	IC DM7830	SMM S/C	GSFC	GSFC	NOTE 11
60	19	DIODE 1N3600	OSO	JANTXV1N3600	MIL-S-19500/231	
7	20	TRANSISTOR 2N2907A	OSO	JANTXV2N2907A	MIL-S-19500/291	NOTE 10
1	21	TRANSISTOR 2N2222A	OSO	JANTXV2N2222A	MIL-S-19500/255	NOTE 10
2	22	RESISTOR 150Ω, 1/4W, 5%	OSO	RLR07C151JR	MIL-R-39017/1	
2	23	1KΩ	OSO	102		
1	24	2KΩ	OSO	202		
20	25	3KΩ	OSO	302		
60	26	4.7KΩ	OSO	472		
100	27	10KΩ	OSO	103		
2	28	RESISTOR 30KΩ, 1/4W, 5%	OSO	RLR07C303JR	MIL-R-39017/1	
8	29	CAPACITOR 100pf, 200V, 10%	OSO	M39014/1-0339	MIL-C-39014	
100	30	.01μf, 200V, 10%	OSO	M39014/1-1593	MIL-C-39014	
8	31	1μf, 20V, 10%	OSO	011015-105-K10	SCI A011015	
12	32	CAPACITOR 15μf, 15V, 10%	OSO	011008-156-K10	SCI A011008	

LIST OF MATERIALS OR PARTS LIST

ELU

SIZE A | CODE IDENT NO. 17981 | DWG NO PER TITLE

SCALE | REV | SHEET 2 of 4

ELU

QTY REQ'D	ITEM NO.	NOMENCLATURE OR DESCRIPTION	APPROVED FOR	PART OR IDENT NO.	SPEC	MATERIAL OR NOTE
4	33	CONNECTOR 2DB52 P-K47	OSO	019044-05	SCI A019044	NOTE 9
4	34	CONNECTOR 2DC79 P-K47	OSO	019044-07	SCI A019044	NOTE 9
8	35	CONNECTOR AMP BOX 120	OSO	016028-05	SCI A016028	NOTE 9
18	36	CONNECTOR AMP BOX 120	OSO	MS5302/25-2	MIL-C-55302	NOTE 9
8 PR	37	SCREW LOCK ASSY - FEMALE	OSO	019043-03	SCI A019043	
4	38	LUG #333	OSO	2910115-1	SCI DWG 2910115	
A/R	39	WIRE #22 Single Conductor	OSO	TYPE E, AWG #22 19 Strand Silver Plated, White Teflon	MIL-W-16878	
A/R	40	WIRE #26 Single Conductor	OSO	TYPE E, AWG #26, 19 Strand Silver Plated, White Teflon	MIL-W-16878	
A/R	41	WIRE RG-196/U Coaxial	OSO	RG-196/U Coaxial	MIL-C-17D	
A/R	42	WIRE #24 Twisted Pair Shielded	—	AWG #24 TPS	MIL-W-16878/4	NOTE 1
A/R	43	LACING TAPE, CLASS 2	OSO	STUR-40	MIL-T-713	
72	44	RETAINER, PWB 3D	OSO	019117-152B3.0	SCI A019117	
144	45	RIVET, SOLID BODY, 100° CSK 1/16 DIA X .188 LONG	OSO	MS20426A2-3	MS20426	
2	46	COMPRESSION PAD ELU	OSO	3341609-2	SCI DWG 3341609	
1	47	CKT CARD ASSY, BD 1	OSO	3341711-2	SCI DWG 3341711	
1	48	CKT CARD ASSY, BD 2	OSO	3341726-2	SCI DWG 3341726	

LIST OF MATERIALS OR PARTS LIST

ELU	SIZE A	CODE IDENT NO. 17981	DWG NO PER TITLE
	SCALE	REV	SHEET 3 of 4

ELU

QTY REQ'D	ITEM NO.	NOMENCLATURE OR DESCRIPTION	APPROVED FOR	PART OR IDENT NO.	SPEC	MATERIAL OR NOTE
					SCI DWG 3341723	
1	49	CKT CARD ASSY, BD 3	050	3341723-2		
1	50	4	050	3341714-2	714	
1	51	5	050	3341729-2	729	
1	52	6	050	3341720-2	720	
1	53	7	050	3341708-2	708	
1	54	9	050	3341705-2	705	
1	55	10	050	3341702-3	702	
1	56	CKT CARD ASSY, BD 11	050	3341702-1	SCI DWG 3341702	
					MATERIALS LIST	
		*MECHANICAL PARTS TBD	SEE	GENERAL - PARTS &		

LIST OF MATERIALS OR PARTS LIST

ELU

SIZE	CODE IDENT NO.	DWG NO	
A	17981	PER TITLE	
SCALE	REV		SHEET 4 of 4

DPC

QTY REQ'D	ITEM NO.	NOMENCLATURE OR DESCRIPTION	APPROVED FOR	PART OR IDENT NO	SPEC	MATERIAL OR NOTE
2	1	IC LM139D	—	LM139AD/883	883B	NOTE 5
22	2	DIODE 1N3600	OSO	JANTXV1N3600	MIL-S-19500/231	
26	3	DIODE 1N5416	OSO	JANTXV1N5416	MIL-S-19500/411	
6	4	DIODE 1N823A	OSO	JANTXV1N823A	MIL-S-19500/159	
2	5	TRANSISTOR 2N2222A	OSO	JANTXV2222A	MIL-S-19500/255	NOTE 10
10	6	TRANSISTOR 2N2907A	OSO	JANTXV2907A	MIL-S-19500/291	NOTE 10
2	7	TRANSISTOR 2N2484	OSO	JANTXV2484	MIL-S-19500/376	NOTE 10
8	8	TRANSISTOR 2N5487	—	012114-1	SCI A012114	NOTE 1,2,10
2	9	RESISTOR .1Ω, 1W, 1%	PPL-12	RWR80S-.1Ω-1W-1%	MIL-R-39007/8	
2	10	15Ω, ¼W, 5%	OSO	RLR07C150JR	MIL-R-39017/1	
2	11	47Ω, ¼W, 5%	OSO	RLR07C470JR	MIL-R-39017/1	
4	12	62Ω, ¼W, 5%	OSO	RLR07C620JR	MIL-R-39017/1	
2	13	150Ω, ¼W, 5%	OSO	RLR07C151JR	MIL-R-39017/1	
8	14	200Ω, 2W, 1%	PPL-12	RWR81S-200Ω-2W-1%	MIL-R-39007/9	
2	15	820Ω, ¼W, 5%	OSO	RLR07C821JR	MIL-R-39017/1	
2	16	RESISTOR 1.5KΩ, ¼W, 5%	OSO	RLR07C152JR	MIL-R-39017/1	

LIST OF MATERIALS OR PARTS LIST

DUAL POWER CONVERTER
(QTY'S FOR 1 EACH DPC)

SIZE	CODE IDENT NO.	DWG NO
A	17981	PER TITLE

SCALE | REV | SHEET 1 of 4

DPC

ORIGINAL PAGE IS
OF POOR QUALITY

QTY REQ'D	ITEM NO.	NOMENCLATURE OR DESCRIPTION	APPROVED FOR	PART OR IDENT NO	SPEC	MATERIAL OR NOTE
2	17	RESISTOR 1.5KΩ, ½W, 5%	OSO	RLR20C152JR	MIL-R-39017/2	
2	18	3KΩ, ¼W, 5%	OSO	RLR07C302JR	MIL-R-39017/1	
4	19	3.3KΩ	OSO	332		
6	20	4.7KΩ	OSO	472		
2	21	10KΩ	OSO	103		
2	22	13KΩ	OSO	133		
2	23	15KΩ	OSO	153		
4	24	18KΩ	OSO	183		
2	25	47KΩ	OSO	473		
2	26	62KΩ	OSO	623		
8	27	RESISTOR 100KΩ, ¼W, 5%	OSO	RLR07C104JR	MIL-R-39017/1	
2	28	CAPACITOR 330pf, 200V, 10%	OSO	M39014/01-1348	MIL-C-39014	
4	29	470pf, 200V, 10%	OSO	M39014/01-0351	MIL-C-39014	
10	30	.1µf, 100V, 10%	OSO	M39014/02-0350	MIL-C-39014	
4	31	4.7µf, 50V, 10%	OSO	M39003/01-3088	MIL-C-39003	
6	32	CAPACITOR 3.3µf, 15V, 10%	OSO	M39003/01-2988	MIL-C-39003	

LIST OF MATERIALS OR PARTS LIST

DPC

SIZE	CODE IDENT NO.	DWG NO
A	17981	PER TITLE
SCALE	REV	SHEET 2 of 4

DPC

QTY REQ'D	ITEM NO.	NOMENCLATURE OR DESCRIPTION	APPROVED FOR	PART OR IDENT NO	SPEC	MATERIAL OR NOTE
2	33	CAPACITOR 4.7µf, 10V, 10%	OSO	M39003/01 - 2974	MIL-C-39003	
2	34	6.8µf, 35V, 10%	OSO	-3024		
2	35	18µf, 50V, 10%	OSO	-3099		
2	36	8.2µf, 20V, 10%	OSO	-3005		
2	37	15µf, 20V, 10%	OSO	-3009		
4	38	15µf, 75V, 10%	OSO	-3141		
4	39	47µf, 35V, 10%	OSO	-3032		
4	40	CAPACITOR 68µf, 15V, 10%	OSO	M39003/01 - 2994	MIL-C-39003	
4	41	CORE 55-121-A2	—	013017-55121-A2	SCI A013017	NOTE 1
6	42	CORE 55040-A2	OSO	013017-55040-A2	SCI A013017	
2	43	CORE 55030-A2	OSO	013017-55030-A2	SCI A013017	
2	44	CORE 80523-1/4 DMA	OSO	013034-2	SCI A013034	
2	45	CORE 52134	—	TBD	TBD	NOTE 1,2
A/R	46	MAGNET WIRE, AWG #20-36	OSO	TYPE-T2, CLASS 105	MIL-W-583	
1	47	PW BOARD ASSY, SWITCHING	OSO	3341342-2	SCI DWG 3341342	
1	48	ELECTRONICS ASSY (CONN)	OSO	3341325-1	SCI DWG 3341325	

LIST OF MATERIALS OR PARTS LIST

DPC

SIZE	CODE IDENT NO.	DWG NO
A	17981	PER TITLE
SCALE	REV	SHEET 3 of 4

DPC

QTY REQ'D	ITEM NO.	NOMENCLATURE OR DESCRIPTION	APPROVED FOR	PART OR IDENT NO.	SPEC	MATERIAL OR NOTE
1	49	HOUSING ASSY	OSO	3341303-1	SCI DWG 3341303	
1	50	COVER	OSO	3341306-1	SCI DWG 3341306	
1	51	COVER ASSY, REAR	OSO	3341307-1	SCI DWG 3341307	
1	52	ID PLATE	OSO	3341312-2	SCI DWG 3341312	
2PR	53	SCREW LOCK ASSY	OSO	019043-03	SCI A019043	
2	54	CONNECTOR 50 PIN AMP CON	OSO	016028-02	SCI A016028	NOTE 9

ORIGINAL PAGE IS OF POOR QUALITY

LIST OF MATERIALS OR PARTS LIST

DPC

SIZE	CODE IDENT NO.	DWG NO
A	17981	PER TITLE

SCALE | REV | SHEET 4 of 4

QTY REQ'D	ITEM NO.	NOMENCLATURE OR DESCRIPTION	APPROVED FOR	PART OR IDENT NO	SPEC	MATERIAL OR NOTE
4	1	CONNECTOR 2DE19S-K47	OSO	019044-02	SCI A019044	NOTE 9
1	2	CONNECTOR 2DB52S-K47	OSO	019044-06	SCI A019044	NOTE 9
1	3	CONNECTOR 2DC79S-K47	OSO	019044-08	SCI A019044	NOTE 9
12 PR	4	SCREW LOCK ASSY-FEMALE	OSO	019043-03	SCI A019043	
4	5	EMI FILTER ERIE-1215-025	PPL-12	S-311-P-5/4	GSFC-S-311-P-5	
2	6	LUG #333 ZIERICK	OSO	2910115-1	SCI DWG 2910115	
26	7	BIFURCATED TERMINAL	OSO	019002-1	SCI A 019002	
2	8	RESISTOR 1K, 1/4W, 5%	OSO	RLR07C102JR	MIL-R-39017/1	
A/R	9	WIRE #22 Single Conductor	OSO	TYPE E, AWG#22, 19 Strand Silver Plated, White Teflon	MIL-W-16878	
A/R	10	WIRE #26 Single Conductor	OSO	TYPE E, AWG#26, 19 Strand Silver Plated, White Teflon	MIL-W-16878	
A/R	11	LACING TAPE, CLASS 2	OSO	STUR-40	MIL-T-713	
		*MECHANICAL PARTS TBD	SEE GENERAL - PARTS & MATERIALS LIST			

LIST OF MATERIALS OR PARTS LIST

ERA JUNCTION BOX
(Qty's for 1 Each)

SIZE	CODE IDENT NO.	DWG NO
A	17981	PER TITLE

SCALE	REV	SHEET
		1 of 1

ORIGINAL PAGE IS OF POOR QUALITY

ERA CABLES

QTY REQ'D	ITEM NO.	NOMENCLATURE OR DESCRIPTION	APPROVED FOR	PART OR IDENT NO.	SPEC	MATERIAL OR NOTE
1	1	CONNECTOR JTP02RE-12-35P(011)	—	016032-07	SCI A016032	NOTE 6,9
4	2	JTP02RE-22-35P(011)	050	016032-01	SCI A016032	NOTE 9
2	3	JTP02RE-24-35P(011)	050	016032-02	SCI A016032	NOTE 9
1	4	JTG06RE-22-35S(011)	050	016033-01	SCI A016033	NOTE 9
1	5	JTG06RE-24-35S(011)	050	016033-02	SCI A016033	NOTE 9
4	6	2DB19P-K47	050	019044-01	SCI A019044	NOTE 9
8	7	2DB52P-K47	050	-05		NOTE 9
4	8	2DC52S-K47	050	-06		NOTE 9
1	9	2DC79P-K47	050	-07		NOTE 9
4	10	CONNECTOR 2DC79S-K47	050	019044-08	SCI A019044	NOTE 9
A/R	11	WIRE #22 Single Conductor	050	TYPE E, AWG #22, 19 Strand Silver Plated, White Teflon	MIL-W-16878	
A/R	12	WIRE #24 Single Conductor	050	TYPE E, AWG #24, 19 Strand Silver Plated, White Teflon	MIL-W-16878	
A/R	13	WIRE #26 Single Conductor	050	TYPE E, AWG #26, 19 Strand Silver Plated, White Teflon	MIL-W-16878	
A/R	14	WIRE RG-196/U Coaxial	050	RG-196/U Coaxial	MIL-C-17D	
A/R	15	WIRE #24 Twisted Pair Shielded	—	AWG #24 TPS	MIL-W-16878/4	NOTE 1
A/R	16	LACING TAPE, CLASS 2	050	STUR-40	MIL-T-713	

LIST OF MATERIALS OR PARTS LIST

ERA CABLE SET PARTS LIST
(Qty: for 1 Each Set, 6 Unique Cables)

SIZE	CODE IDENT NO.	DWG NO
A	17981	PER TITLE
SCALE —	REV	SHEET 1 of 2

ERA CABLES

QTY REQ'D	ITEM NO.	NOMENCLATURE OR DESCRIPTION	APPROVED FOR	PART OR IDENT NO	SPEC	MATERIAL OR NOTE
2 1PR	17	SCREW LOCK ASSY - MALE	OSO	019043-4	SCI A019043	NOTE 7

LIST OF MATERIALS OR PARTS LIST

ERA CABLE SET PARTS LIST	SIZE A	CODE IDENT NO. 17981	DWG NO PER TITLE
	SCALE	REV	SHEET 2 of 2

GENERAL

QTY REQ'D	ITEM NO	NOMENCLATURE OR DESCRIPTION	APPROVED FOR	PART OR IDENT NO	SPEC	MATERIAL OR NOTE
A/R	1	CEMENT	050	020005-1	SCI A020005	
A/R	2	ADHESIVE	050	020048-1	SCI A020048	
A/R	3	SCREW, MACH, PAN HD, CROSS REC CRES, #6-32UNC-2X 1½ LONG	050	MS51957-36	MS51957	
A/R	4	SCREW, MACH, PAN HD, CROSS REC CRES, #6-32UNC-3 X 1¼ LONG	050	MS51957-35	MS51957	
A/R	5	SCREW, MACH, PAN HD, CROSS REC CRES, #4-40 NC-2 X ¼ LONG	050	MS51957-13	MS51957	
A/R	6	SCREW, CAP, SOCKET HD-HEX CRES, #6-32 UNC-3 X ½ LONG	050	MS16995-18	MS16995	
A/R	7	SCREW, MACH, FLAT HD, CROSS REC CRES, #6-32NC X 3/8 LONG	050	MS24693-C26	MS24693	
A/R	8	SCREW, MACH, PAN HD, CROSS REC CRES, #4-40NC X 3/16 LONG	050	MS51957-12	MS51957	
A/R	9	SCREW, MACH, PAN HD, CROSS REC CRES, #2-56 X ¼ LONG	050	MS51957-3	MS51957-3	
A/R	10	POLYURETHENE RESIN SOLVENT DILUTED TWO PART	REPLACES COATING	020184-1	SCI A020184	NOTE 8
A/R	11	THICKENING AGENT	050	020040-1	SCI A020040	
A/R	12	SILICONE SPONGE SHEET	050	AMS 3195	POST CURE @250°F FOR 24 HRS	
A/R	13	INSERT, SELF LOCKING #8-32	050	019032-3	SCI A019032	
A/R	14	INSERT, HELI-COIL, #4-40NC	050	MS21209-C0415	MS21209	
A/R	15	INSERT, HELI-COIL, #8-32NC	050	MS122119	MS122119	
A/R	16	INSERT, HELI-COIL, #6-32NC	050	MS21209-C0615	MS21209	

LIST OF MATERIALS OR PARTS LIST

GENERAL - PARTS & MATERIALS	SIZE A	CODE IDENT NO. 17981	DWG NO PER TITLE
	SCALE	REV	SHEET 1 of 3

QTY REQ'D	ITEM NO.	NOMENCLATURE OR DESCRIPTION	APPROVED FOR	PART OR IDENT NO.	SPEC	MATERIAL OR NOTE
A/R	17	MAGNESIUM ALLOY	050	TYPE AZ31B-H24	QQ-M-443	
A/R	18	MAGNESIUM ALLOY	050	TYPE AZ31B	QQ-M-31	
A/R	19	ALUMINUM ALLOY	050	2024-T4 HEX STK	QQ-A-225/6	
A/R	20	ALUMINUM ALLOY	050	6061-T6	QQ-A-250/11	
A/R	21	ALUMINUM ALLOY	050	6061-T6	QQ-A-225/8	
A/R	22	STAINLESS STEEL TYPE 303	050	TYPE 303 COND A	QQ-S-766	
A/R	23	GLASS BEAD	050	019019-1	SCI A019019	
A/R	24	PLATE ID	050	020015-10	SCI A020015	
A/R	25	CHEMICAL FILM, CLASS 3	050	CHEMICAL FILM, CLASS 3	MIL-C-5541	
A/R	26	INSULATION SLEEVING .125 DIA, COLOR CLEAR	050	—	MIL-I-23053/8	
A/R	27	PROTECTIVE COATING, EPOXY RESIN	050	020038-1	SCI A020038	
A/R	28	TAPE, TEFLON	050	TFE # 61	MIL-T-23594	
A/R	29	SOLDER	050	SN63WRMAP3	QQ-S-571	
A/R	30	WIRE, 020 DIA, NI A	050	020033-2	SCI A02033	
A/R	31	TUBING, TEFLON, AWG # 24	050	—	MIL-I-22129	
A/R	32	RIVET, SOLID BODY, 100° CSK 1/16 DIA X .188 LONG	050	MS20426A2-3	MS20426	

LIST OF MATERIALS OR PARTS LIST

GENERAL - PARTS & MATERIALS	SIZE A	CODE IDENT NO. 17981	DWG NO PER TITLE
	SCALE	REV	SHEET 2 of 3

QTY REQ'D	ITEM NO.	NOMENCLATURE OR DESCRIPTION	APPROVED FOR	PART OR IDENT NO.	SPEC	MATERIAL OR NOTE
A/R	33	NUT, PLAIN HEX, SMALL PATTERN CRES # 2-56	OSO	NAS671C2	NAS671	
A/R	34	FINISH TYPE III	OSO	———	MIL-M-3171	
A/R	35	PRIMER	OSO	# 463-9-6		
A/R	36	CAT-A-LAC FLAT BLACK EPOXY PAINT	OSO	# 463-3-8	CURE 24 HRS @ 160°F	
A/R	37	CATALYST	OSO	CA-118		
A/R	38	MYLAR SHEET	OSO	MYLAR .007 THK	MIL-P-55010	
A/R	39	NUT, CLINCH, SELF LOCKING	OSO	019118-13	SCI A019118	
A/R	40	SCREW, 82° FLAT HD, CROSS REC CRES, #4-40NC x 5/16 LONG	OSO	MS51959-14	MS51959	
A/R	41	SCREW, 82° FLAT HD, CROSS REC CRES, #6-32NC 7/16 LONG	OSO	MS51959-29	MS51959	
A/R	42	"O" STRIP	OSO	3341313-1	SCI DWG 3341313	

ORIGINAL PAGE IS OF POOR QUALITY

LIST OF MATERIALS OR PARTS LIST

GENERAL - PARTS & MATERIALS

SIZE A | CODE IDENT NO. 17981 | DWG NO PER TITLE

SCALE | REV | SHEET 3 of 3

PARTS TRANSFER

QTY REQ'D	ITEM NO.	NOMENCLATURE OR DESCRIPTION	APPROVED FOR	LOT CONTROL NUMBER	SPEC/DWG	DATE CODE
1	1	Compression Pad	OSO	300249	SCI 3341310-1	
3	2	Compression Pad	OSO	300342	SCI 3341310-1	
16	3	Screw	OSO	111822	MS51959-14	
12	4	Screw	OSO	111824	MS16995-18	
96	5	Screw	OSO	111820	MS51957-35	
37	6	Screw	OSO	113153	MS51959-3	
12	7	Screw	OSO	113348	MS51957-13	
92	8	Screw	OSO	111811	MS51957-36	
2000	9	Terminal	OSO	114119	SCI 019002-1	
2000	10	Terminal	OSO	114120	SCI 019002-2	
26	11	Terminal	OSO	114118	SCI 019073-1	
487	12	Rivet	OSO	114796	MS20426-A2-3	
2	13	Bracket, Connector	OSO	80423	SCI 3341308-1	
2	14	Bracket, Connector	OSO	300344	SCI 3341308-1	
18	15	Insert	OSO	113459	MS122119	
42	16	Lug	OSO	42589	SCI 2910115-1	

LIST OF MATERIALS OR PARTS LIST

PARTS TRANSFER LIST (SCI OSO STOCK TO SMM STOCK)	SIZE A	CODE IDENT NO. 17981	DWG NO PER TITLE
	SCALE	REV	SHEET 1 of 2

PARTS TRANSFER

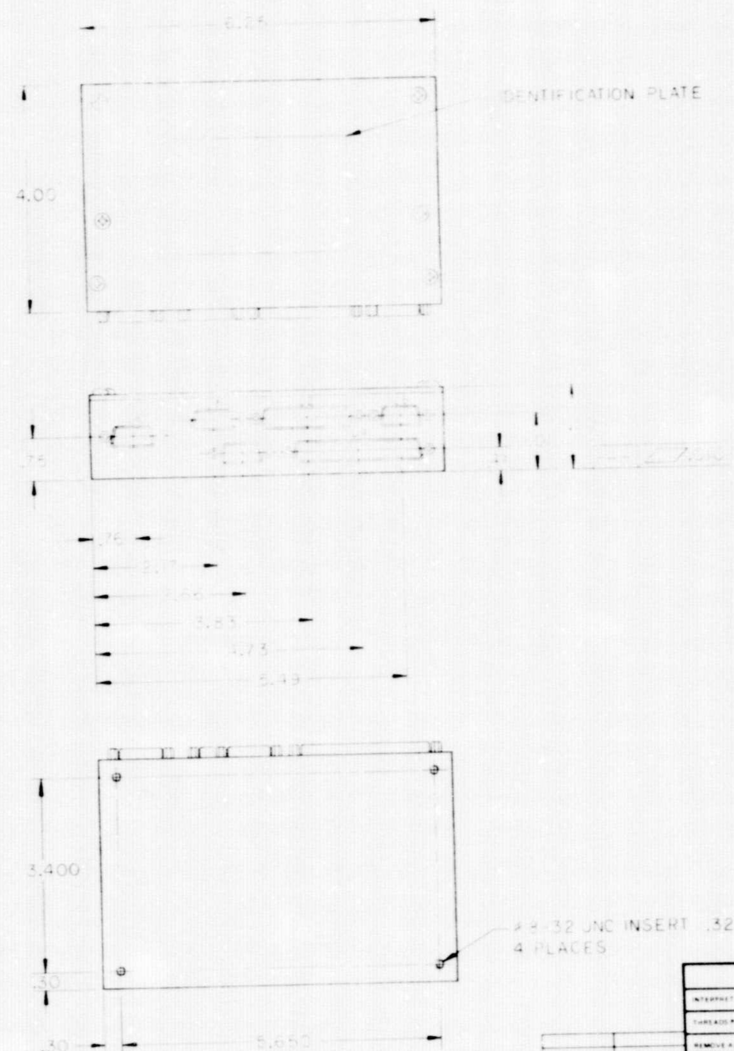
QTY REQ'D	ITEM NO.	NOMENCLATURE OR DESCRIPTION	APPROVED FOR	LOT CONTROL NUMBER	SPEC/DWG	DATE CODE
5	17	'O' Strip	OSO	111996	SCI 3341313-1	
1	18	PC Board	OSO	20098	SCI 3341341	
1	19	Relay 3SAM607M2	OSO	32832	MIL-R-5757/21C	
2	20	Relay 421D-26	OSO	115745	MIL-R-5757/39B	
11	21	IC SN54LS1T	OSO	112872	SCI 015040/50	3719
1	22	IC SN54LS1T	OSO	112870	SCI 015040/50	3719
1	23	IC SN54LS1T	OSO	112869	SCI 015040/50	3719

LIST OF MATERIALS OR PARTS LIST

PARTS TRANSFER LIST
(SCI OSO STOCK TO SMM STOCK)

SIZE	CODE IDENT NO.	DWG NO
A	17981	PER TITLE
SCALE	REV	SHEET 2 of 2

ORIGINAL PAGE IS
OF POOR QUALITY



NOTES:

1. FINISH PER MIL-M-3171, TYPE III. PAINT ALL EXTERIOR SURFACES EXCEPT SURFACE "A" USING ONE COAT PRIMER #463-9-6 FOLLOWED BY CAT-A-LAC FLAT BLACK EPOXY PAINT #463-3-8, CATALYST # CA-118. CURE 24 HOURS AT 160°F.
2. REFERENCE WIRE LIST FOR CONNECTOR PIN FUNCTIONS.

REF DES	FUNCTION	SCI PART NO.	MFG PART NO.
J1	COMPUTER	019044-02	2DE19S-K47
J2	SPACECRAFT SIGNAL	019044-06	2DB52S-K47
J3	BI-LEVEL DATA	019044-02	2DE19S-K47
J4	EXTERNAL CONTROL	019044-08	2DB79S-K47
J5	ANALOG DATA	019044-02	2DE19S-K47
J6	SPACECRAFT POWER	019044-02	2DE19S-K47

LIST OF MATERIALS OR PARTS LIST

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES

SCI SYSTEMS, INC.

CONTROL DRAWING

ERA JUNCTION BOX

SIZE D | CODE IDENT NO. 17981 | DWG NO. 4263TED